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Economic Benefits of Conservation of Free Areas in Apomu, Isokan Local Government Area, Osun State, Nigeria

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ABSTRACT

Background and Objective: Free areas are areas that are not demarcated and classified by the government. They are a vital source of income for rural households as they are home to native and exotic tree species. Hence, this study focused on the socio-economic benefits of the conservation of free areas in Apomu, Isokan Local Government Area, Osun State to encourage sustainable forest management. **Materials and Methods:** The 69 villages were purposively selected for this study. The reason for this selection was that these villages host significant free areas where active forestry-related activities were carried out. A total of 69 questionnaires were used for the study. Data were analyzed with descriptive statistics and logistic regression with a significant coefficient of 0.05. **Results:** The common tree species present in free areas include; *Albizia* spp., *Milicia excelsa, Khaya senegalensis, Ceiba pentandra, Tectona grandis, Gmelina arborea, Terminalia ivorensis*. Conservation activities carried out in the area include; afforestation (100%), arrest of illegal loggers (100%), tree inspection (100%), and hammering (100%). Major socio-economic benefits of conservation include: continuous wood supply (100%), prevention of exploitation of under-aged trees (100%), increase in income generation (100%), and increase in the income of rural families (100%). Illegal grazing, poor road network, and insufficient manpower are the main constraints faced in the free zones with odds-ratio of 98.77, 45.79, and 44.57, respectively. **Conclusion:** Good road networks should be established for effective patrolling and protection of the free areas.

KEYWORDS

Free areas, tree species, conservation, sustainable forest management, socio-economic benefits

INTRODUCTION

The decline in the total forested areas in Nigeria cannot be overstated[1] as it has now caused widespread concern about the conservation of free areas at both national and local levels. However, it is appropriate to maintain free areas. Therefore, conservation should be approached with close coordination between the Forestry Department and other stakeholders. The role of the community in the conservation of free areas is also of vital importance[2]. Free areas are forest regions not classified or managed by the government, unlike state-owned forest reserves. While these areas aren't strictly regulated, anyone wanting to harvest trees must get permission from the State Forestry Departments (SFDs). Free areas offer

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extra sources of forest products and help sustain important tree species[3]. In Nigeria as in many places, these tree species have been overlooked because most efforts focus on managing protected areas and reserves[4]. This highlights the importance of preserving free areas for sustainable forestry. Therefore, the need to preserve these areas for sustainable forest management is of paramount importance.

Sustainable use means keeping stable populations of species that humans harvest and use. However, this idea can be understood differently depending on what needs to be sustained[4]. As with many species of flora and fauna, over-exploitation is a significant danger for many plants and animal species, including trees[5]. The most common threats are the conversion of forest to agricultural land, urban sprawl, habitat fragmentation, livestock farming, invasive species, and the use of fire. For conservation measures to be effective, all sustainable management efforts must be considered as much as possible. Sustainable forest management is based on methods that aim to improve future yields of forest products and future benefits from environmental services[5]. Implementing good forest management practices undoubtedly helps maintain the value of forests as sources of timber and other forest products, while helping to preserve biodiversity and protect watersheds and other ecosystem functions. Good management can also lead to significant changes in ecosystem processes.

The ability of free areas to serve as a relief agent for rural residents cannot be overstated. However, the degradation of the free areas and the subsequent loss of ecosystem services on which the rural populations depend pose major challenges to sustainable livelihoods. This is due to the many challenges faced by the sustainable management of free areas. Therefore, this study aims to assess socio-economic benefits of the conservation of free areas for sustainable management in Apomu, Isokan Local Government Area, Osun State to encourage sustainable forest management in the study area.

MATERIALS AND METHODS

Isokan is a Local Government Area of Osun State, Nigeria located at 7°20 00"N 4°11 00"E. According to the 2006 census, its population was 103,177. The area's postal code is 221. Isokan LGA comprises several towns and villages such as Ekpomu, Aronla, Akoogun, Odofin, Ladaru, Alabamejo, Ajebamidele, Onilewo, and Sunbare. The population of Isokan LGA is 87,951 inhabitants. The residents of the area are mainly members of the Yoruba ethnic group. The Yoruba language is commonly spoken in the region while Christianity and Islam area are the most practiced religions in the area. Isokan LGA has several important traditional rulers including Olukoyi of Ikoyi and Alapomu of Apomu. Festivals held in Isokan LGA include the Osun-Ikoyi festival[6].

Pilot survey: An exploratory study was conducted to determine the suitability of the study area. This was also done to ensure familiarity with the study location.

Sampling procedure: From the exploratory survey conducted, 79 villages/ free areas were identified in Apomu, Isokan Local Government Area. Of these free areas, 69 villages were actively involved in forest-related activities while the others were only engaged in agriculture, trading, or mining. Furthermore, these 69 villages were purposively selected because they house the major free areas with valuable tree species in the Local Government Area. Hence, a complete census of all (69) free areas involved in forestry activities was carried out. The targets for this study were the major timber traders. A total of 69 questionnaires were administered for this study. In addition, institutional information was requested from the forest officials responsible for the free areas to complement the data obtained from the administered questionnaire.

Method of data collection: The study was conducted for 12 months i.e.,18th September, 2023 and 22nd August, 2024. Primary and secondary data were used for the study. The primary data were collected using a structured questionnaire. The questions were designed to identify free areas and common trees found

in them; assess conservation activities practiced in free areas; socio-economic benefits of conservation efforts in free areas and challenges militating against sustainable management of free areas. While secondary data were obtained from the Osun State Forestry Department, literatures, journals, and the internet. The data were analyzed using descriptive and logistic regression analysis at 5% level of significance. The logistic regression analysis was used to determine the challenges militating against sustainable management of free areas. The logistic regression analysis is presented as follows:

$$Y = \frac{\text{Exp}\ (b_0 + b_1x_1 + b_2x_2 ..... b_{10}x_{10})}{1 \exp (b_0 + b_1x_1 + b_2x_2 ..... b_{10}x_{10})} \quad (1)$$

Where:

Y = Challenges militating against sustainable management of free areas (CMSMFA) (dependent variable)

b_0, b_1, b_2...b_{10} = Regression parameters

Independent variable includes:

X_1 = Inadequate funding for patrol and protection of free areas (IFPPFA)
X_2 = Bad road network (BRN)
X_3 = Inadequate equipment for patrol and protection (IEPP)
X_4 = Inadequate manpower (IMP)
X_5 = Illegal logging/hunting in free areas (ILHFA)
X_6 = Fire outbreak (FO)
X_7 = Destruction of forest trees by farmers (DFTF)
X_8 = Lack of co-operation among farmers (LCF)
X_9 = Illegal grazing in free areas (IGFA)
X_{10} = Conflicts between forest official and farmers (CFOF)

RESULTS

The result in Table 1 shows the socio-demographic characteristics of the respondents. The result indicated that 78.3% of the respondents were male while 21.7% were female. This shows that there were more men than women in the free areas. This can be explained by the fact that men take up more difficult jobs to provide for their families. This also shows that men are more resilient to stress which allows them to engage in more tedious work than their female counterparts. The result of the age distribution of the respondents revealed that the age group with the highest percentage was 60-69 years (34.7%) indicating that this age group participated more in activities of the free areas. They were followed by respondents in the age group 50-59 years with 31.9% while the lowest age group was 20-29 years with 1.5%.

This indicates that the majority of the respondents although they tend to be older, are still active and able to participate in the sustainable management of free areas. This result also revealed that 92.8% of the respondents were married. Furthermore, most of the respondents had secondary education (34.8%), followed by primary education (29.0%) while those with higher education had the lowest scores, at 17.4%. This shows that formal education is not a major requirement for forest-dependent communities but their biggest concern is the easy, cheap, and readily available agricultural practices needed to sustain their livelihoods.

Regarding years of residence in the area, it was found that the majority of respondents had lived in the area for 16 years or more with 91.3%. This indicates that the respondents are quite open-minded and well-informed about environmental events. Household sizes of 16 and above recorded the highest

Table 1: Socio-demographic characteristics of respondents

Socio-demographic characteristics	Frequency	Percentage
Gender		
Male	54	78.3
Female	15	21.7
Total	69	100
Age		
20-29	1	1.5
30-39	3	4.4
40-49	9	13.0
50-59	22	31.9
60-69	24	34.7
70 above	10	14.5
Total	69	100
Marital status		
Married	64	92.8
Single	1	1.4
Divorced	2	2.9
Widowed	2	2.9
Total	69	100
Educational level		
Informal	20	29
Primary	13	18.8
Secondary	24	34.8
Tertiary	12	17.4
Total	69	100
Years of living in the area		
0-5	3	4.4
6-10	1	1.5
11-15	2	2.8
16 above	63	91.3
Total	69	100
Household size		
1-5	5	7.3
6-10	3	4.3
11-15	3	4.3
16 above	58	84.1
Total	69	100
Occupation		
Farmer	12	17.4
Forest officials	5	7.3
Timber contractor/merchant	52	75.4
Total	69	100
Nativity		
Indigene	64	92.8
Non-indigene	5	7.2
Total	69	100

with 84.1% while 11-15 and 16-20 households had the least percentage of 4.3%. The size of the family is a function of the larger commitment of the family and is therefore related to the expected income of the family for a better standard of living. In addition, the use of family labor is necessary for the management of the free areas. The main occupation of the respondents was timber business with 75.4%. This implies that respondents with these professions play a more important role in the preservation and management of free areas.

The result in Table 2 shows the sizes of free areas. It was found that the majority of the respondents (43.5%) had 3 acres of free areas on which they carried out forestry and other activities. However, others reported free areas as 2 acres (28.2%), while some respondents (3.7%) had 5 acres. The result also shows that tree species were present in the free areas with 100% of respondents stating in the affirmative. While

Table 2: Free areas and common tree species found in the study area

Variables	Frequency	Percentage
Size of free area		
2 Acres	19	28.2
3 Acres	30	43.5
4 Acres	17	24.6
5 Acres	3	3.7
Total	69	100
Are you involved in other occupations?		
Yes	8	11.6
No	61	88.4
Total	69	100
Other occupation		
Trading	8	11.6
Are there trees in the free area?		
Yes	69	100
No	0	0
Total	69	100
Type of tree species		
Exotic	5	7.2
Indigenous	64	92.8
Total	69	100

92.8% of the respondents indicated that the tree species were indigenous tree species. This means that free areas are homes to native tree species. Therefore, it is necessary to consider sustainable management of these areas.

Common tree species identified in the study area: The result in Table 3 shows common trees available in the study area. The indigenous tree species include; *Albizia* spp., *Milicia excelsa, Khaya senegalensis, Ceiba pentandra, Tectona grandis, Gmelina arborea, Terminalia ivorensis, Ricinodendron, Antiaris africana, Terminalia superba, Celtis* spp., *Ficus* spp., *Alstonia* spp., *Triplochiton scleroxylon, Phyllanthus* spp., *Cassia* spp., etc. While species such as *Tectona grandis* and *Gmelina arborea* are exotic. However, the various uses of trees in the study area include: roofing, building and for construction purposes etc. This finding also shows that free areas are sources of timber and other forest products; therefore, for conservation measures to be effective, all sustainable management efforts should be given maximum attention.

The result in Table 4 shows the conservation methods adopted to preserve the trees in free areas. Based on the responses received from the respondents, the main activities include afforestation/reforestation (100%), arrest of illegal loggers (100%), inspection of tree by forest guards (100%), hammering of trees before harvesting (100%), etc. This shows that effective conservation methods are key factors in sustainable forest management of free areas.

The result in Table 5 shows the socio-economic benefits of conservation activities in free areas and their implications for sustainable management. The main benefits mentioned are: promoting the continuous supply of timber (100%), preventing the exploitation of under-aged trees (100%), increasing revenue generation to the government (100%), increasing the income of rural households (100%), etc. This indicates that to maintain any sustainable management practices, conservation activities in these areas should be given special attention. This shows that the implementation of good forest management practices undoubtedly contributes to maintaining the value of forests as sources of timber and other forest products.

Table 3: Common tree species identified in the study area

S/N	Tree species	Local name		Yes common name frequency (%)	Number frequency (%)	Species type	Uses
1	*Albizia* spp.,	Ayunre	Albizia	69 (100%)	0 (0)	Indigenous	Interior decoration
2	*Milicia excels*	Iroko	African teak	69 (100%)	0 (0)	✓	Furniture, roofing
3	*Khaya senegalenses*	Ogaun	Mahogany	26 (37.7%)	43 (62.3%)	Exotic	Building, roofing, furniture
4	*Antiaris Africana*	Oriro	False iroko	67 (97.1%)	2 (2.9%)	Indigenous	Furniture
5	*Terminalia superba*	Afara	White afara	69 (100%)	0 (0)	✓	Building, furniture
6	*Celtis* spp.	Ita	Sugar berry	69 (100%)	0 (0)	✓	Roofing
7	*Ficus* spp.	Obobo	Ficus	69 (100%)	0 (0)	✓	Furniture, fodder
8	*Ricinodendron* spp,	Eepu	Ricnodendron	69 (100%)	0 (0)	✓	Decking
9	*Phyllanthus* spp.	Akomu	Indian goose berry	39 (56.5%)	30 (43.5%)	✓	Decking
10	*Triplochiton scleroxylon*	Arere	Obeche or African	67 (97.1%)	2 (2.9%)	✓	Building, furniture white wood
11	*Cassia* spp.	Cassia	Cassia	69 (100%)	0 (0)	✓	Roofing
12	*Alstonia* spp.	Ahun	God's tree	69 (100%)	0 (0)	✓	Building
13	*Terminalia ivorensis*	Idigbo	Black afara	68 (98.6%)	1 (1.4%)	Exotic	Building, furniture
14	*Nauclea diderrichii*	Opepe	Opepe	0 (0)	69 (100%)	Exotic	Furniture, logging, interior decoration, poles
15	*Gmelina arborea*	Gmelina	Gmelina	23 (33.3%)	46 (66.7%)	Exotic	Building, furniture
16	*Tectona grandis*	Teak	Teak	24 (34.8%)	45 (65.2%)	✓	Furniture, building, poles
17	*Mangifera indica*	Mangoro	Mango	35 (50.7%)	34 (49.3%)	Exotic	Fruit and firewood
18	*Anacardium occidentale*	Cashew	Cashew	2 (2.9%)	67 (97.1%)	Indigenous	Fruit
19	*Ceiba pentandra*	Araba	White silk	66 (95.7%)	3 (4.3%)	Exotic	Decking, interior cotton tree decoration
20	*Moringa olefera*	Moringa	Moringa	13 (18.8%)	56 (81.2%)	✓	Medicinal purpose, fodder
21	*Chrysophyllum albidum*	Agbalumo	Star apple	69 (100%)	0 (0)	✓	Fruits
22	*Azadirachta indica*	Dongoyaro	Neem	3 (4.3%)	66 (95.7%)	✓	Medicinal purpose

http://doi.org/10.17311/tas.2022.26.35 | Page 31

Table 4: Conservation activities practiced in the free area

Conservation activities	Yes (%)	No
Afforestation/reforestation	69 (100)	0 (0)
Inspection of tree by forest guards	69 (100)	0 (0)
Regular patrol of forest areas from time to time	69 (100)	0 (0)
Numbering of trees with stump number	69 (100)	0 (0)
Issuance of inspection certificates	68 (98.6)	1 (1.4)
Protection of free areas illegal loggers	69 (100)	0 (0)
Arrest of illegal loggers if caught in free areas	69 (100)	0 (0)
Imposition of fines on offenders	69 (100)	0 (0)
Issuance of licenses to concessioners	69 (100)	0 (0)
Hammering of trees before they are harvested	69 (100)	0 (0)
Prohibition of bush burning	69 (100)	0 (0)
Awareness/enlightenment campaign	69 (100)	0 (0)

Table 5: Socio-economic benefits of conservation efforts in the free areas

Benefits	Yes (%)	No
Encourages continuous supply of timber	69 (100)	0 (0)
Prevents exploitation of under-aged trees	69 (100)	0 (0)
Increase in revenue generation for government	69 (100)	0 (0)
Increase rural household income	69 (100)	0 (0)
Regulation of illegal activities in free areas	69 (100)	0 (0)
Ensures that only trees with specified dimension, girth are logged	68 (98.6)	1 (1.4%)
Creation of employment for people	68 (98.6)	1 (1.4%)
Continuous supply of varieties of forest and wild animals	68 (98.6)	1 (1.4%)
Prevention of erosion and encroachment in free areas	69 (100)	0 (0)
Reduction of atmospheric pollution	69 (100)	0 (0)
Provision of materials (NTFPs) for domestic and industrial purposes	69 (100)	0 (0)

Logit regression model for challenges militating against sustainable management in free areas:

$$CMSMFA = 3.27-2.15IFPP+3.82BRN+1.96IEPP+3.80IMP+2.34ILHFA$$
$$-17.93FO+1.75DFTF-0.57LCF+4.59IGFA-6.51CBFOF \quad (2)$$

Where:

N = 69

Chi-Square (df, 9) = 12.26

Odds-ratio (unit change): Constant (26.37) IFPP (0.12) BRN (45.79) IEPP (7.10) IMP (44.58) ILHFA (10.34) FO (0.00) DFTF (5.78) LCF (0.56) IGFA (98.78) CBFOF (0.001).

Where:

CMSMFA = Challenges militating against sustainable management of free areas
IFPP = Inadequate funding for patrol and protection of free areas
BRN = Bad road network
IEPP = Inadequate equipment for patrol and protection
IMP = Inadequate manpower
ILHFA = Illegal logging/hunting in free areas
FO = Fire outbreak
DFTF = Destruction of forest trees by farmers
LCF = Lack of cooperation among farmers
IGFA = Illegal grazing in free areas
CBFOF = Conflicts between forest official and farmers

Table 6: Logit regression for challenges militating against sustainable management in free areas

Challenges	Coefficients	Odds-ratio
IFPP	-2.146	0.117
BRN	3.824	45.788*
IEPP	1.96	7.096*
IMP	3.797	44.574*
ILHFA	2.336	10.335*
FO	-17.932	0.00
DFTF	1.754	5.78*
LCF	-0.573	0.564
IGFA	4.593	98.777*
CBFOF	-6.51	0.001
Model χ^2 (df, 9) = 12.26, p>0.05		

Significant at p>0.05 CMSMFA: Challenges militating against sustainable management of free areas (Yes = 1, No = 0), IFPP: Inadequate funding for patrol and protection of free areas, BRN: Bad road network, IEPP: Inadequate equipment for patrol and protection, IMP: Inadequate manpower, ILHFA: Illegal Logging/Hunting in free areas, FO: Fire outbreak, DFTF: Destruction of forest trees by farmers, LCF: Lack of Cooperation among Farmers, IGFA: Illegal grazing in free areas and CBFOF: Conflicts between forest official and farmers

The model 1 showed the influence of the independent variables on the dependent variable. It showed how each variable contributed to the challenges that militated against sustainable management of the free areas. From the equation, it can be concluded that dependent variables such as insufficient funding for patrolling and protection (IFPP), forest outbreak (FO), lack of cooperation among farmers (LCF), and conflicts between forest officials and farmers (CBFOF) have negative or opposite relationship with constraints encountered by respondents. However, bad road networks (BRN), inadequate equipment for patrol and protection (IEPP), inadequate man-power (IMP), illegal logging/hunting in free areas (ILHFA), destruction of forest trees by farmers (DFTF), and illegal grazing in free areas (IGFA) had a significant impact on the challenges faced in free areas. Table 6 revealed that illegal grazing in free areas (IGFA) was a major challenge with the highest odds ratio of 98.77, followed by BRN, IMP, ILHFA, IEPP, and DFTF with odds-ratio of 45.79, 44.57, 10.34, 7.10 and 5.78, respectively. The logistic regression analysis indicated that there was sufficient evidence that the estimated coefficient for the factors was not zero.

Forest officer's opinion on conservation activities in the study area: To corroborate the findings of the respondents of the area, the opinions of key forest officers were sought. It was found that the main conservation activities carried out in the study area include: The promotion of afforestation/reforestation, arrest of illegal loggers, inspection of tree by forest guards, and hammering of trees before harvesting among others. It was clarified that for a tree to be hammered, the following steps must be carefully followed, including:

- The owner's consent must be sought i.e., without the owner's consent trees cannot be hammered except for trees in government reserve areas
- Trees must be inspected by a forest guard to ascertain if they meet the necessary requirement of maturity
- After inspection by forest guards, the numbering of the trees is done and each tree is assigned a stump number
- The next step is the issuance of approval forms and tree inspection certificates by the forest guard
- This is followed by the issuance of the government permit by the tax collector in the forestry office
- After proper verification of documents, hammering is done and all the planks with pass hammer are released while the tree tops are arrow marked
- Log certificates are then also issued to the tree takers
- Finally, the used permits are returned to the forestry office to be properly documented

DISCUSSION

The results indicate that more males than females participated in conservation activities, suggesting that men were more often interviewed and engaged in demanding tasks to support their families. This aligns with Olawuyi *et al*.[7] findings that men tend to handle stress better allowing them to undertake more strenuous work than their female counterparts. Regarding age distribution, the highest percentage came from individuals aged 60-69 years. Indicating that older age groups are still active in managing free areas. This was in line with Díaz *et al*.[8] who noted that the productive age for agricultural and forestry activities is typically between 31-60 years. The result further revealed that most of the respondents were married indicating that respondents have responsibilities of caring and providing for their families. This supported the findings of Olawuyi *et al*.[7] who stated that a high percentage of the rural populations are married. Most of the respondents had secondary and primary education. This supported the findings of Falana *et al*.[6], who found out that formal education, is not critical for forest-dependent communities as their main concern is affordable and easily accessible farming practices for sustaining their livelihoods.

It was also found that tree species were available in the study area, most of which are indigenous tree species implying that free areas are home to valuable timber species. This confirms the findings of Mullan *et al*.[5] who stated that forests and free areas are sources of timber and other forest products. Therefore, for conservation action to be effective, all sustainable management efforts should be given maximum attention. The conservation activities adopted for tree conservation in the study area indicate that effective conservation methods are key factors in the sustainable forest management of free areas. Therefore, this confirms the conclusions of Mullan *et al*.[5] who stated that the application of good forest management practices undoubtedly contributes to maintaining the value of forests as sources of timber and other forest products.

Key socio-economic benefits such as promoting a continuous supply of timber, prevention of exploitation of under-aged trees, increasing revenue generation for the government, increasing the income of rural households, etc., demonstrate that to maintain any sustainable management practice, special attention should be paid to conservation in these areas. Therefore, this supported the findings of Olawuyi *et al*.[7] who stated that the application of good forest management practices unquestionably contributes to maintaining the value of forests as sources of timber and other forest products.

Illegal grazing in free areas was a major obstacle encountered in the free areas followed by poor road networks and inadequate manpower. This shows that the free areas are faced with many challenges and these pose a significant challenge to free area conservation. To reverse the trend of biodiversity loss, transformative changes are needed to address the root causes[8].

CONCLUSION

Tree species were present in the free areas most of which were native tree species. Tree species available in the study area include; *Albizia* spp., *Milicia excelsa*, *Khaya senegalensis*, *Ceiba pentandra*, *Tectona grandis*, *Gmelina arborea*, *Terminalia ivorensis*, etc. The main conservation activities carried out in free areas include afforestation/reforestation, arrest of illegal loggers, inspection of trees, and hammering of trees, among others. The benefits of conservation of free areas were: A continuous supply of timber, prevention of exploitation of under-aged trees, increase in revenue generation to the government, and increase in rural household income. Therefore, for any sustainable management practice to be maintained, conservation efforts in these areas must be given special attention. A good road network must be established to ensure effective patrolling and protection of free areas.

SIGNIFICANCE STATEMENT

Indigenous people and rural communities have long managed and benefited from free areas and increasingly have legal access to the resource base. The development of these areas into sustainable economically viable sources relies on a series of activities that are carried out every day to improve the

sustainability of the areas. In many developing countries, free areas are important natural resources for rural communities. They provide food, shelter, and fuel, which are used to support rural households, while millions of people live in these areas or depend on them for survival. In addition, many forest communities are in a unique position to contribute to the protection, maintenance, and management of these areas.

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